

## THE LANGUAGE SPACE

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*ABSTRACT: The theoretical assumption put forward in the present paper is that text is a natural phenomenon, whose development is governed by inner dynamics, as regular as regards any living system. This dynamics becomes accessible through the language mechanism (I. Bierschenk, 1989). Through language an individual forms his inner mental space into a textual representation. On the surface, because of writing conventions, the text is linearly progressing. Its inner dynamics thus outlined cannot be measured by ordinary frequency counts or relational indicators, since those measures prerequisite materialisation. Perspective Text Analysis (PTA) is a new methodological development which handles both the verbal flow and the information flow in text production. The following presentation will give a short outline of some of the fundamentals of PTA and show in what way both flows can be linked in an analysis over levels.*

### Formation of a Language Space

PTA builds on an integrated theory of perception and action. For measuring the space its underlying model considers the energy invested in text production. Thus the verbal flow generated by the individual in the process of text building is associated with the Agent (A) component while the information flow generated by an environment is associated with the Objective (O) component. Both components are co-ordinated by the moves or actions (a) taken. The co-ordinates in the formation of a language space are formed differentially. Differentiation is dependent on the intervals with which the objectives are deposited throughout a text. Thus different gradients define the variables associated with the O-component. For example, viewpoints are the variables of the Figure component which is a sub-component of the Objective. It represents the focal points that are defined by short intervals between the points of observation.



Another sub-component is the Ground component, whose variables are the standpoints and whose task is to relate the text production to reality. Together, Figure and Ground form the basic co-ordinate system within which a text can develop. In addition, a Means component with aidpoints as variables and a Goal component with set-points as variables support or motivate actions.

**Reversible and irreversible flows.** Because of an observed irreversibility in the flowing Objective and the displacement of objective weight over to the Agent, some restrictions are put onto the assignment of tags. In the flow, the objective of highest order restrict the tagging of the flow in falling order. Moreover, a further restriction concerns the P-shifted (passive) verb. P-shift means that the Agent ( $X_p$ ) is located in the space which imposes a reversibility on the Objective, such that the objectives shift their functional position.

**The functional clause.** The text writes itself according to limit cycles which implies that limit cycles control the discontinuities and changes in the verbal flow. By specifying a time unit, here called a period, clock-like cyclic and recursive algorithmic procedures establish a dynamic regime. This means that we have to expect conditions of machinery in language. By demarcations made through sentence markers and clause markers, functionally working clauses are established. Thereby the verb acts as a functional constant which co-ordinates the agent part (A) with the objective part (O). The step indicated by a verb is consequently called the **functional clause** (I. Bierschenk, 1992 b). The simple main rule for establishing the directionality between the A- and O-component is the textual manifestation of the a-component. The presence of (a) means the functional presence of an A-variable and at least one O-variable, which together constitute the functional clause, marking a step in the system. A potential transformation takes place whenever the system makes a start or restart in processing a functional clause during a specified period. Two main conditions govern the processing, namely that an agent has not been identified and/or that the verb is not P-shifted. This second condition is tested by the endings dictionary. The first has two alternatives. The clause marker can open up an empty slot before the verb, i. e. no string can be found between clause marker and verb. The other implies that a preposition (= pointer) in initial position shuts the slot. In this case, the system detects strings between pointer and a verb. The system inserts in both cases the transformed agent ( $X_a$ ) into the empty slot. The functional clause



thus provides the linkage to the language space, which is functional and not geometric. It is a **maker** of elasticity.

The central properties of the transport mechanism can now be summarised in the form of the AaO-machine (B. Bierschenk, 1991) which makes possible the discovery of structural information that is independent of the AaO-machine itself. With respect to the complementary role of the A- and O-component, the following, basic activities are carried out:

- (1) governed by openers, an iterative procedure interchanges strings of graphemes.
- (2) dummies for the agent (A) and objective (O) are substituted with strings.
- (3) the agent dummies are processed by a forward or downward swing.
- (4) the objective dummies are processed by a backward or upward swing.
- (5) pendular down- and upward swings perform according to "limit cycles".
- (6) the limit cycle mode controls the discontinuities and changes in the verbal flow.
- (7) clock-like cyclic and recursive algorithmic procedures establish a dynamic regime.

### The Viscal-Elasticity of the Language System

A number of studies employing PTA have been carried out by single researchers from various disciplines. In the following, an example of measuring the verbal flow with PTA will be given that is related to a recent experiment on the study of "tacit knowledge" (B. Bierschenk, 1993 b). In the present context, the Latin text from Tacitus' *Germania* as translated into Italian makes up the experimental text. The paragraphs (on the 'suiones', Chapter 44) read as follows:

Da qui in avanti abitano, dentro all' Oceano, le tribù dei Suioni, la cui potenza, oltre che su uomini e armi, si fonda sulle flotte. Le loro navi hanno una forma diversa dalle nostre: entrambe le estremità presentano una prua adatta all'approdo. Non le governano con le vele, né, muniscono le fiancate con ordini di remi: il movimento dei remi è libero, come in alcuni fiumi, e vario: da una parte o dall'altra, secondo la situazione.

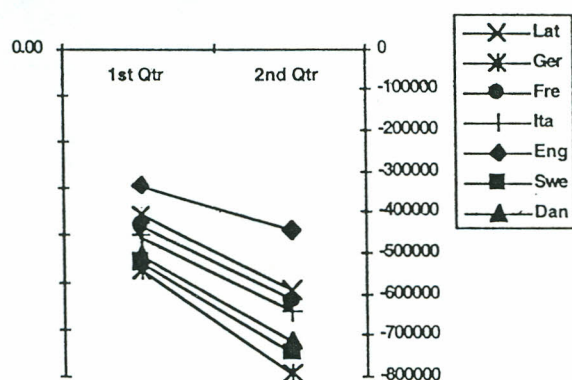


Onorano anche la ricchezza: per questo motivo uno solo governa, senza alcuna restrizione, e il vincolo dell'ubbidienza é assoluto. Le armi non sono a disposizione di tutti, come presso gli altri Germani, ma sono tenute sotto custodia (precisamente da parte di uno schiavo), dato che l'Oceano impedisce le improvvise incursioni dei nemici e le schiere di soldati rimaste inattive facilmente si rilassano: in realtà non è di alcuna utilità per il re mettere a guardia delle armi un nobile, un cittadino comune e nemmeno un liberto.

The verbal flow in this text functions as information on constraints that act on the **Style** of writing of its producer. Thus, the flow in text is dynamic and can be measured with respect to its viscal and elastic component on the basis of a model that takes into account the basic components of "text mass", "text extension" or work put into a text, and the naturally occurring periods (B. Bierschenk, 1992, 1993 a). In the same way as an individual grows physically and mentally as a function of age, an individual text develops into a system that can be associated with a history. The rhythm in building this system may vary in style ranging from being loose and runny to being highly concentrated or even firm. By several translations of the Latin text a frame of reference is supplied for the interpretation of the viscosity of the flow in the Italian version. Figure (1) depicts the decomposed linear relations between viscosity and elasticity.

Figure 1.

*The Decomposed Linear Relations between the Potentials of Action and Processing*



Each single curve represents a particular writing style and consequently the rhythm of text building that organises the language space, whose co-ordinates strive toward a rhythmic and functional balance. In the same way as any living system is subjected to dis-



tortions, the language system is subjected to dislocations of its parts and to distortions of its organisational component. The plot of Figure (1) shows in the first quadrant the "strain" operating mainly on the viscal component. The second quadrant describes "sheer", which is mainly operating on the elastic component. In general, "potential of action" in relation to the "pressure", i. e. the forcefulness, in writing characterise the individual's style.

By specifying the viscosity versus fluidness of writing the decomposed linear relations between the potentials of text building and text processing can be grouped. Of interest in the present context is the group composed of the Romance languages, where the Italian translator has produced a more flexible and stretchable fabric mode of texture compared to the French and the original writer. However, with respect to their strain and sheer the Latin, French and Italian text parallel each other.

### **The Topological Invariants of the Language System**

A special purpose system of computer programs has been constructed by Helmersson (1992) in order to translate the main principles of PTA into the PC-system PERTEX. The special purpose of this system is to differentiate the perspective structure underlying a verbal flow from its objective structure and to extract the invariants of these structures.

The input to PERTEX is the Italian text in the shape as shown above. Its algorithmic processing results in distinctive verbal strings, which constitute the basis for setting up matrices, one for each O-component, since their co-ordination with the A-component give rise to different structural relations. The rows of each matrix consists of unique strings which are studied with respect to their closeness. The result of this analysis is a natural grouping. In agglomerating the rows it can be observed as a striking fact that diverse and hybrid strings can be grouped and hierarchically organised in such a way that topological invariants can be identified and named. It is the topological lay-out of these invariants that generates and forms the limit mental space of the experimental text represented in Figure (2) and described as follows:

"Preparedness" has two aspects. One is related to motivation which influences the performance of actions to be taken toward some specific events. The other is cognitive and concerns the judgement of these upcoming events. A transformation of this initial state



through "Fluidness" implies that flow-structures are at work. These may be regarded as a continuum characterised by low resistance to change. The resulting singularity gives expression to high level functioning in the task of performing operations speedily and swiftly. Skilful and elaborated execution of the involved strategies of action is determined by "Flexibility". When the process of transformation enters this state, "Capacity" comes into existence. This terminus determines the production or performance level in picking up and handling information. The next transforming state is a measure of ability as determined by the degree of difficulty of upcoming events. The resulting singularity means that the information picked up is put together into a coherent whole. In this respect, "Superiority" deals with emergent novelties and outstrips known examples of proficiency. Methodological applications change this singularity into "Dominance". This terminus addresses a relationship in which someone is in a position of control over others. Its Latin meaning is simply ruling. The final outcome in the Ground is "Fitness". Obviously, the "Ruling" is related to its dependence on a regime that is adequately adapted to continually and spontaneously changing states.

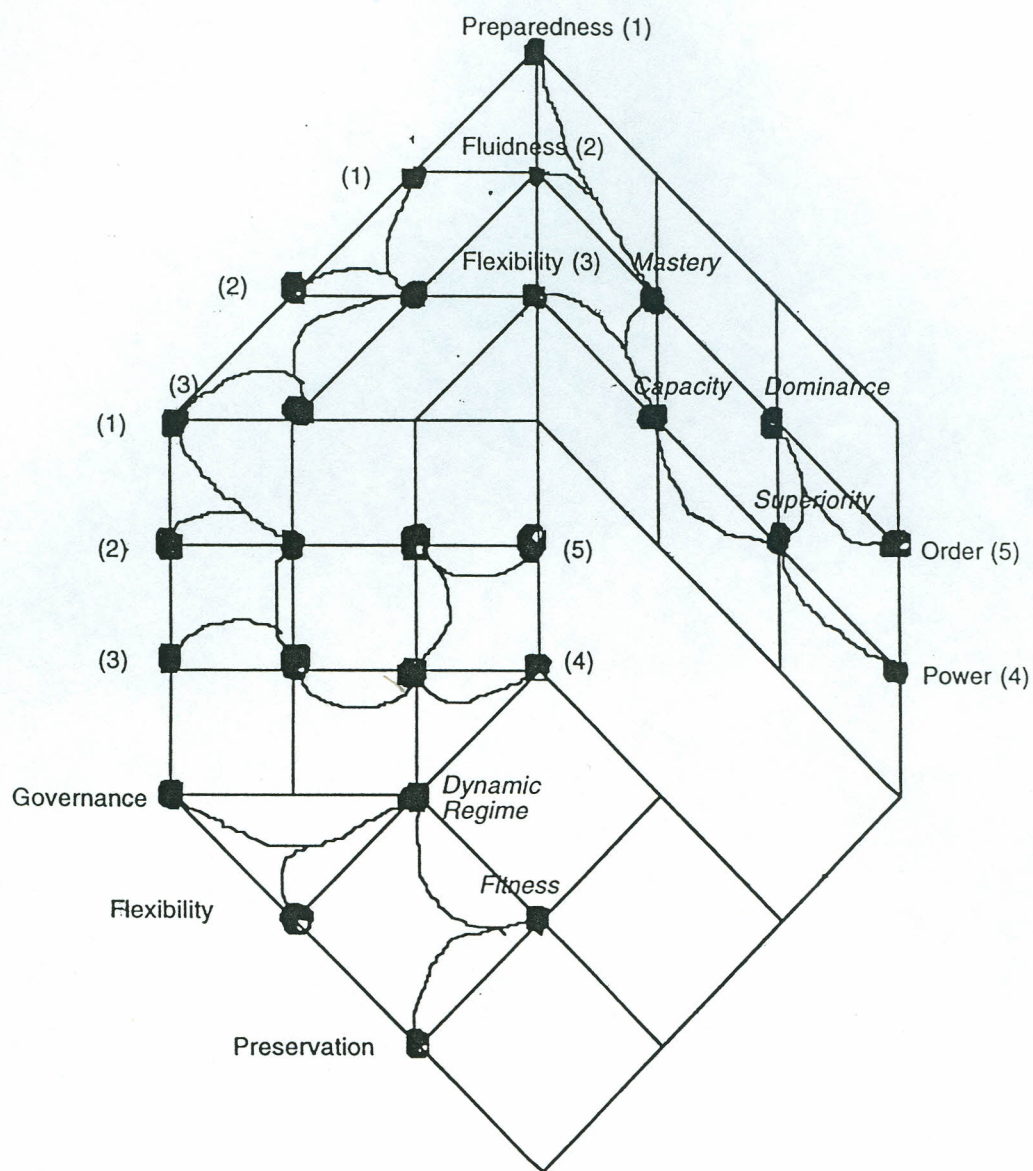
The space is depicted in cubic form. Through this measure the configuration produced by the textual agents and objectives (i. e. the variables of measurement) and their relationship, unity is maintained. This unity is the product of the schematising process directly built into perception and action. The perceptual activity of assembling patterns of rhythmic movement throughout a text defines the quality of the perceptual path emerging in Figure (2). Its phase sequences and assemblies of phase sequences are from a formal logical point of view the topologically defined invariants manifested in the points where the bifurcations arise. Mentally, a bifurcation is the transformed amalgamation of two cluster terms which produces a metaphysical state.

**Perspective transformation.** The pattern of rhythmic movement expressed through the asymmetrical relation between the view-, stand-, aid-, and setpoints of a text and its textual agents generates the agent clusters. The connection matrix, which is the key instrument for uncovering the structural relations in the perspective, is automatically produced and can also be used to reproduce the binary matrix between unique points of a particular component and its unique agents. This means that, in the perspective, clusters pertaining to the objective component can be picked up and transformed. Extracting the perspective is a unique quality in PTA.



Figure 2.

*The Metaphysical Cube of the Operating Structural Relations in Italian*





The foreground of Figure (2) represents the perspective on the Figure component of the Italian text, while the top represents the perspective on the Ground component. A general remark is that the extracted invariants of the perspective structure is characterised by an identity relation, which usually is not the case. Thus no symmetry-breaking instabilities could be observed in the extracted focus of perspective. The decisive idea is that agent-specific information flows with very little if any loss or degeneracy.

**The coupling of verbal flow to information flow.** In writing a mental space both behavioural and cognitive abilities are involved. For measuring a space, the AaO-model used, has to consider at least three dimensions, the individual (X) axis, the axis of the object (Y) and a time (T) dimension. The axiomatic basis is the Agent (A)-action (a)-Objective (O) schema, whose operation means a distinction between an individual agent's (A) co-operation (a) with its environment (O). Every AaO move means an active perceptual shift of angles striving toward an establishment of perspective and environmental invariants. The aim of the coupling is to provide a synthesis by means of a structural whole, manifested in the textual whole. Because of the linear functioning of the reading (= book-keeping) mechanism there are distortions left behind on the textual surface as the text moves on. These function as "peep-holes" into the structure, that is, the differentiating and integrating processes conserved over the entire text (texture). By a certain set of rules, those holes are to be filled with textual material being their spatial reference. This means that the strings inserted into the dummy slots cannot be momentarily interpreted regardless of at what point in time they were processed. In principle, the main rules may seem very simple but in practice it is a very complicated process because of the chained relations between several clauses and the self-reference between dummies. The resolution of self-reference and convergence to a balanced expression in this sense means that two functional entities are to be co-ordinated to form a unity, while conserving the asymmetrical relations of the inner dynamics (I. Bierschenk, 1992 a). In principle the text is unbounded, although the algorithmic functioning of PERTEX determines the limits within which a language space can be established. PERTEX provides for the detection of the governing subject, an "I" in discourse, and the (in)stabilities in the verbal as well as in the information flow that have been produced. By controlling the "biological time" of the "I's" writing, the structural whole is regenerated from the verbal flow and represented by its final singularity. Since biological time is bound to



the individual and not only to the species, individuality must be unambiguously encoded in the text. Individuality written into the language mechanism provides for the self-referentiality in text building. It is this mechanism that writes the unique profiles of the mental space into a language space. Table (1) gives a summary of the spaces projected by means of their final singularities (B. Bierschenk (1993 b):

Table 1.

*Co-operation between Micro and Macro Level*

Strain/Sheer	Final Outcome Figure	Ground
<i>High</i>		
English	Safety	Barrier
<i>Medium</i>		
Latin	Superiority	Dynamic Regime
French	Watchfulness	None
Italian	Dominance	Fitness
<i>Low</i>		
Danish	Control of Dangerousness	Adjustment
Swedish	Harnessing of Action	Safety
German	Strength	Rigorousness

The extreme cases of Table (1) are represented by the German focus on *Strength* and the English focus on *Safety*. The English space gives expression to a different experience of the unpredictable "Swedes" than can be read from the German space. The Latin and Italian Spaces focus on *Superiority* and *Domination* while the French Space parallels this conceptualisation of the Swedes with *Watchfulness*. Although very similar in translation when compared on the basis of content, the spaces projected divide German, Swedish and Danish on one hand and Italian, French, Latin and British on the other. It is interesting to note that English, although culturally defined as a German language, makes up its own group, but determines a space that is mentally closer to the Roman culture than to the German. In short the act of writing transforms the perceptual determinants into mental ones by the "coupling" of verbal flow to information flow in language. Linguistically, syntax is prior to lexical and morphological properties for the measurement of language space.



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